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NAVY DEPARTMENT, BUREAU OF SHIPS, MANAGEMENT OF CHANGES TO CONTRACTS FOR THE CONSTRUCTION AND CONVERSION OF SHIPS

A System Analysis

by

LCDR William J. Ryan, SC, USN

Thesis
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NAVY DEPARTMENT, BUREAU OF SHIPS, MANAGEMENT OF CHANGES TO CONTRACTS FOR THE CONSTRUCTION AND CONVERSION OF SHIPS

A System Analysis

by

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//
Bachelor of Science, U.S. Naval Academy, 1952

Thesis submitted to the School of Government and Business Administration of The George Washington University in partial satisfaction of the requirements for the degree of Master of Business Administration

April 30, 1966

Thesis approved by

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PREFACE

Before obtaining access to the financial data used in the preparation of this paper, the writer was advised by the responsible Government custodians that any identification of such data with the associated private contractor might constitute a violation of the Government's special trust with respect to safeguarding proprietary information. He was further advised that the results of relevant Navy Department management audits and inspections were considered privileged information. Accordingly, no specific shipbuilders have been identified in this paper, and the separate findings and recommendations of internal Navy Department reviews of Bureau of Ships contract administration practices and performance have been excluded from its scope.

Acknowledgment is made to those officers and civilian employees of the Assistant Secretary of the Navy for Installations and Logistics, the Chief of Naval Material, and the Bureau of Ships, whose valuable assistance contributed significantly to the preparation of this paper.

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INTRODUCTION

The Problem

One of the serious management problems facing the Department of the Navy today is the timely and effective administration of changes to fixed-price government contracts with private shipbuilders for the construction and conversion of naval vessels. This problem is exemplified by the fact that on December 31, 1965, the total estimated value of unpriced contract changes was in excess of a quarter of a billion dollars, representing over 9,000 individual unpriced changes.[1]

Although the amplitude of these figures is staggering in itself, the contractual and financial implications to both the Government and the shipbuilding industry are even more significant. To the contractor, outstanding contract changes may represent unresolved claims upon the Government for work in process or completed, or substantial payments withheld pending determination of total contract price. To the Government, they represent over 400 contracts with much of their inherent fixed-price integrity dissipated through "open" contract prices and an immense financial obligation based primarily on rough Government estimates. In essence, the condition

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[1] Data compiled from U.S. Navy, Bureau of Ships, Report of "Inventory of Unadjudicated Changes on Hand," period ending December 31, 1965.

denotes significant unresolved contractual obligations on the part of both buyer and seller.

Notwithstanding the magnitude of the problem and the substantial motivation of both parties toward a timely solution, the outlook for eliminating this backlog or, more importantly, preventing its recurrence under existing and forecast conditions is not optimistic. New changes were issued at a rate of about 480 per month during calendar year 1965, while a monthly average of 478 changes were processed to completion.[2] Furthermore, an appraisal of future shipbuilding programs discloses no reasonable basis for assuming that the rate of issuance of new changes will vary significantly from past performance.

The Objective

The most obvious and direct method to correct this condition would be to eliminate or severely restrict the issuance of contract changes by the Government. This approach, although contractually appealing, is considered impractical. Most of the changes are considered technically mandatory or necessary, for example, to correct design deficiencies, repair government-furnished material, correct system defects, or make necessary repairs under conversion contracts. Optional items are reviewed by a special board prior to their issuance to determine their feasibility and desirability in terms of cost and delay. They must be approved by this board prior to issuance.

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[2]These rates are developed and discussed more fully in Chapter III.

A second course of action would be to increase substantially the number of Government field contract administration personnel. This metho also has its short-run limitations. Assuming that civil service personnel ceilings were appropriately increased and budgetary restrictions adjusted accordingly, additional qualified personnel are usually not locally available or are unwilling to relocate at shipyard sites with or without an increase in salary. This approach also presupposes that contractors are similarly willing to increase their contract administration staffs on a comparable basis and are equally successful in locating and hiring satisfactory qualified employees in this specialized field.

This paper is based on the assumption that a third alternative--that of improving existing contract management practices to facilitate more expeditious processing of changes utilizing resources on hand--is the most practical approach to a realistic solution. Accordingly, its objective is to perform a comprehensive and constructive examination of the Navy's system for administering changes to shipbuilding and conversion contracts to determine the extent to which it fulfills the objective of efficient realization of a satisfactory level of performance, to determine its defects, to analyze the findings, and to make substantive recommendations for correction or improvement. In gauging a "satisfactory level of performance" in terms of quantity, one normally thinks in terms of normal demand or workload In the case of this paper, however the extensive backlog of changes must be considered as well as normal workload if its conclusions and

recommendations are to be of any substantive value.

A review of available literature covering the administration of contract change within the Navy Department as well as the results of various reviews of change order practices by internal Navy Department organizations did not evidence the previous conduct of an analysis of this nature. Prior reviews of the problem area have been centered around organization, staffing, and the reasonableness of change order prices.

The Method

A system may be generally defined as a chain of related, essential operations performed in a prescribed manner, consistent with established policy, for the purpose of achieving desired results. Its goal is to attain successfully and efficiently a consistent, satisfactory level of performance.

Changes to Navy shipbuilding and conversion contracts are processed through a well-defined system designed and administered by the Navy Department's Bureau of Ships (hereafter referred to as the Bureau). This system involves both headquarters and field elements organized in a manner prescribed by the Bureau. Policies, procedures, and reporting techniques which govern and define the system are likewise prescribed by the Bureau, subject to federal statute, regulations, and direction of higher command echelons.

The method which this paper employs to analyze the Bureau's contract change administrative system is comparable to the systems analysis

technique employed by management engineers engaged in similar efforts. The systems analysis technique--or approach--to increased efficiency may be described as follows:

> There are two possible approaches to the problem of increasing operating efficiency: one is to induce people to apply more effort to work faster; the other is to simplify the procedures for performing the work so that with the same effort more work will be accomplished. The systems analysis technique stresses this latter approach. [3]

This particular systems analysis involves:

1. A comprehensive examination of the current system in terms of those policies, procedures, and control techniques which fall within the administrative and legal prerogatives of the Bureau.

2. An objective appraisal of current performance in terms of a comparison with a satisfactory level to determine whether or not the system:

   (a) Is capable of handling a normal, average workload effectively.

   (b) Is capable of handling the existing backlog effectively.

3. An evaluation of the current system, in terms of its policies which are within the Bureau's legal and administrative prerogatives, to determine if--and to what extent--system efficiency can be improved.

4. Recommendations, in terms of eliminating, modifying, simplifying or combining procedures which comprise the system, for the

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[3] Norman N. Barish, Systems Analysis for Effective Administration (New York: Funk and Wagnalls, 1951), p. 2.

purpose of achieving a satisfactory level of performance more efficiently.

Sources of Data and Information

The calendar year 1965 has been selected for analysis of prior performance (a) because it is current and (b) because it is considered reasonably representative of future conditions in terms of the expected volume and nature of new contracts and contract changes. Statistics used in the preparation of this paper were obtained primarily through the Bureau's central records. In addition to an extensive review of applicable statutes, regulations, and written policies and procedures, unstructured interviews were conducted with the Director of Procurement, Office of the Assistant Secretary of the Navy for Installations and Logistics; the head of the Shipbuilding and Contract Division, Bureau of Ships, and members of his staff; members of the procurement policy staff of the Chief of Naval Material; and various Navy Department field contract administration personnel. Limited discussions were also held with contract administration personnel employed by private shipyards.

Assumptions and Limitations

In addition to the restrictions on the use of privileged information mentioned in the Preface, the following assumptions and limitations have been imposed:

1. It has been assumed that the rate of issuance of future contract changes will not vary significantly from that of calendar year 1965.

2. Continuation of the existing Bureau headquarters and field organizational structure and staffing has been assumed.

3. It has been assumed that the written policies and instructions of the Bureau are followed by its field activities with reasonable consistency and uniformity.[4]

4. Corrective recommendations have been restricted to those which do not involve or require (a) the enactment of a new federal statute, (b) the amendment of an existing statute, or (c) the reformation of any existing government contracts.

5. The question of reasonableness of negotiated prices for contract changes has purposely been avoided since the matter is considered a separate topic and not relevant to the scope of this paper.

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[4]Conformance inspections are regularly conducted by the Bureau. See page 10.

CHAPTER I

BACKGROUND

A certain amount of background information is necessary in order to gain an appreciation for the objectives, methods, and results of any system. This is particularly true in the case of the Bureau's Contract Change Administration System (hereafter referred to as the Change System). It is the product of a military establishment characterized by a highly formal organization and explicitly detailed missions. Contractual policy, and to a large extent contract administration procedures, are prescribed by federal statute and Department of Defense regulations. The design of the system is constrained by the necessity to comply with such organizational frameworks, missions, statutes, and regulations. Any realistic analysis of the system and recommendations for its improvement are similarly constrained.

Organization and Missions

Headquarters

Chief of Naval Operations. --As military chief of the Navy, the Chief of Naval Operations, in conjunction with the other Joint Chiefs of Staff, formulates detailed strategic plans designed to implement the missions assigned to the Navy by the Secretary of Defense. Within the organizational structure of the Office of the Chief of Naval Operations, there exists a staff element

(Ship Characteristics Board) with the responsibility for determining the characteristics of ships necessary to carry out assigned naval missions. These characteristics, translated into requirements for specific ships and boats, are passed to the Navy Department's Bureau of Ships for procurement action.

Chief, Bureau of Ships. --The Bureau of Ships is the naval activity responsible for research and development, design, construction, conversion, and repair on all Navy ships and boats, except certain service craft assigned to the Bureau of Yards and Docks.[1] Pursuant to a single service assignment by the Secretary of Defense, the Bureau is also responsible for the acquisition, construction, and conversion of ships and boats for delivery to the Military Sea Transportation Service, Air Force and Army, and to foreign countries under mutual defense assistance programs.

Responsibility for the design and furnishing of certain components, machinery, and electronics equipment also rests with the Bureau. This portion of its overall mission, however, is relevant here only to the extent that such equipment becomes Government-furnished material provided to private shipbuilders for installation or placement on board a ship or boat being constructed or converted under a Bureau contract.

Whereas this paper deals primarily with the responsibilities and operation of the Division of Contracts and its related field contract

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[1]See U.S., Navy Department, Bureau of Ships Administrative Manual for a detailed description of the missions and organization of the Bureau of Ships. The subsequent discussions of Bureau organization and missions in this chapter are based on this directive.

administration elements, some appreciation of the functions of several of the remaining organizational divisions of the Bureau is considered essential in order to understand their role in the Bureau's overall procurement operations.

Administrative and Technical Divisions, Bureau of Ships. --Responsibility for the technical and material support functions of the Bureau is assigned to the office of the Assistant Chief of the Bureau for Technical Logistics. This office is responsible for all government-furnished material under the technical cognizance of the Bureau which is to be installed or placed on board a ship or boat, with the exception of nuclear propulsion plants and related equipment. Included in the responsibility are the tasks of recommending the material to be furnished by the Government to the shipbuilder, establishing the design and monitoring the technical adequacy of such material, initiating its procurement and ensuring timely delivery to the shipbuilder's yard. Comparable responsibility for the research, design, development, and furnishing of nuclear propulsion plants and related material is assigned to the Assistant Chief of the Bureau for Nuclear Propulsion.

The Assistant Chief of the Bureau for Field Activities and Inspector General serves as general manager for field activities under the management control of the Bureau. Among other functions, this office is responsible for establishing, organizing, staffing, and inspecting the Bureau's field organizations, including those involved in the field administration of Bureau

contracts. It also reviews and approves the Contract Division's written procurement instructions with respect to their impact on the operations and staffing of the Bureau's field organizations.

The initiation of procurement action for new ship and boat construction and conversion and the maintenance of close technical surveillance over the work until it is completed and accepted by the Navy are among the responsibilities of the Office of the Assistant Chief of the Bureau for Design, Shipbuilding, and Fleet Maintenance. This office works closely with the Ship Characteristics Board in preparing preliminary ship designs, and with other elements of the Bureau's organization in translating preliminary designs into contract plans and specifications. The initial request for procurement, together with the necessary contract plans and specifications to adequately describe the work, the list and description of the material to be furnished by the Government, and the desired delivery date of the finished product are furnished the Division of Contracts for actual procurement action with private contractors. In addition, any Bureau-originated changes to original contract plans and specifications are similarly coordinated, originated, and technically controlled by this office.

The Office of Counsel provides legal advice and services to the Bureau and its field activities. All contracts and supplemental agreements issued by the Bureau are prepared by counsel or are subject to review and approval by counsel prior to execution.

Bureau of Ships Contract Division. --The responsibility for successful accomplishment of ship and boat design, construction, or conversion is discharged by assignment of the work to Navy shipyards or by procurement from private industry. For the latter purpose, the Chief of the Bureau is designated a Contracting Officer with the authority to enter into and administer appropriate contracts in behalf of the Government. The Chief, in turn, has delegated this authority to the Director of Contracts and to specified individuals within the Director's organization (Contract Division). The authority delegated to the Director of Contracts and the designated members of the Contract Division includes authority to issue and adjudicate authorized changes to Bureau contracts.

To carry out his assigned responsibility for the preparation, negotiation, and award of all Bureau contracts and their non-technical administration, the Director of Contracts has under his direction an extensive division which performs the following functions:

1. Determination of the method of procurement and type of contract.
2. Preparation and award of contracts.
3. Development and promulgation of policies, procedures, and instructions for use within Bureau headquarters and field activities for the non-engineering administration of Bureau contracts.
4. Provision of guidance for the exercise of contracting officer authority, including (a) the execution of contract modifications and (b) the negotiation of the modifications.

5. Provision of specific instructions to field activities for all other non-engineering contract administration functions performed under the contracts.

6. Maintenance of a continuing review of the non-engineering contract administration functions performed by field activities.[2]

Specifically, the Shipbuilding and Repair Purchase Branch of the Contract Division is responsible for preparing and placing shipbuilding and conversion contracts, developing related headquarters policies and procedures, review and approval of similar field organization procedures, and maintaining a continuing review of field contracting operations. This Branch is organizationally divided into four sections. Each section is responsible for the award of contracts for specific types of ships--e.g., submarines, destroyers--and each is responsible for the contracting operations of a non-engineering nature of the Bureau field activities located within an assigned geographic area (by Naval Districts). For example, one Purchasing Section contracts for submarines and is responsible for the contracting operations of the supervisors of shipbuilding and Navy Industrial Managers in the Third and Fifth Naval Districts. Contract modifications involving a significant change to the contract scope are also negotiated by a Purchase Section.

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[2]U.S., Navy Department, Bureau of Ships Administration Manual also prescribes in detail the organization and responsibilities of the various sections within the Contract Division.

Field Organizations

Supervisors of Shipbuilding. --Two types of Bureau field activities are directly pertinent to the Bureau's overall responsibility for the procurement of construction, conversion, and repair of ships and boats. These are: (1) the Offices of Supervisors of Shipbuilding (SUPSHIPS) and (2) the Offices of Industrial Managers (INDMANS). The SUPSHIPS administer Navy and other Department of Defense contracts with private shipyards and other contracts under their cognizance, while the mission of the INDMANS includes the responsibility for contracting with private shipyards for the repair of ships. This paper is concerned only with the contract functions of SUPSHIPS.[3]

Consistent with their broad mission of administering Navy and other Department of Defense contracts with their assigned private shipyards, SUPSHIPS are responsible for performing a multitude of procurement functions, including contracting for changes, approving progress payments, consenting to the placement of certain subcontracts, and awarding design contracts. As previously mentioned, however, the primary concern of this paper is SUPSHIPS' contract change function.

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[3]The INDMAN organization is mentioned, however, since it is another major field procurement operation requiring the management of its contracting operations by the same Bureau Shipbuilding and Repair Purchase Branch which is responsible for the management of SUPSHIPS, as well as contracting for the construction and conversion of ships.

The offices of SUPSHIPS are organized in a manner prescribed by the Bureau.[4] Deviations from this organization must be approved by the Office of the Assistant Chief for Field Activities, and personnel ceilings and billet structures and descriptions are also controlled by the same office.

Three major SUPSHIP operating departments are primarily involved in the administration of contract changes: Planning Department, Inspection Department, and Contract and Materials Department.

The Administrative Department and staff billets which perform indirect or minor duties in relation to the contracting functions of SUPSHIPS will be disregarded as essentially irrelevant.

The SUPSHIPS standard organization provides for a Planning Department, which is assigned the following responsibilities with regard to contract change functions:

1. Estimating the cost of a change for financial obligation purposes.

2. Preparing a technical description of the change which adequately describes the work required or deleted for use in the issuance of a contract change order or proposed supplemental agreement to the contractor.

3. Determining the work scope of the change and estimating the types and quantities of material and labor considered necessary to perform the work.

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[4]See U.S. Navy, Bureau of Ships, Shipbuilding and Boat Building Contract Manual (SUPSHIPS Manual), January, 1962, paragraph 3-1.

4. Analyzing the contractor's price adjustment proposals for contract changes in light of the estimate performed in paragraph 3 above and the technical judgment of the Government personnel participating in the analysis.

Personnel assigned these responsibilities are aided by engineering and other technical personnel in the SUPSHIP overall organization.

In addition to its basic responsibility for inspecting the contractor's work for quality and conformance to contract requirements, the Inspection Department assists in the technical analysis of the contractor's proposals for pricing changes. Technical personnel in this department also provide information to the Planning Department and the Contract and Materials Department with regard to the status of ship construction or conversion at the time a change is contemplated or authorized and the projected status during accomplishment of the work required by the change. They may also be called upon to provide the status of contractor performance on a change order which has been issued by the Government and is being accomplished, but has not yet been negotiated or priced as a modification to the contract. Personnel in the Inspection Department, as well as those in the Planning Department, are in frequent communication--written and telephone--with their counterparts in the Bureau, and both departments provide similar information to the Bureau with regard to Bureau-originated changes.

As its name implies, the Contract and Materials Department is responsible for two major and distinct functions. Organizationally it is divided into three divisions:

1. The Facilities Division, which is responsible for administering Government property in the possession of the contractor.

2. The Material Division, which is responsible for (a) controlling and expediting delivery of Government-furnished material, (b) assisting the contractor in expediting the furnishing of contractor-furnished material, (c) administering controlled material requirements, and (d) providing for fitting out and allowance material.

3. The Contract and Finance Division, which is responsible for all contract functions, including the negotiation of equitable price adjustments for contract changes, as well as the maintenance and accounting for public funds allotted by the Bureau to SUPSHIP for performance of its assigned mission.

Defense Contract Audit Agency. --Contract auditing for Navy shipbuilding contracts is a function of the Defense Contract Audit Agency. This agency has resident offices located at private shipyards doing significant work for the Navy.[5]

The resident offices perform two basic functions for the Bureau and SUPSHIPS in connection with ship construction contracts:

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[5]The majority of the personnel assigned to the Defense Contract Audit Agency's resident offices at private shipyards were formerly assigned to Navy Audit offices before the disestablishment of the Contract Audit Division, Office of the Navy Comptroller, in 1965.

1. Determination of allowable costs under cost-reimbursement contracts.

2. Preparation and submission of advisory audit reports to cognizant Government contracting officers or contract administrators to assist in pricing actions under fixed-price contracts.[6]

Applicable Bureau of Ships Contract Provisions

General Provisions

In a few instances involving prototype ships characterized by a marked departure from current or conventional design, ships or boats have been contracted for on a cost-plus-fixed-fee basis. In the vast majority of the cases, however, the Bureau employs firm fixed-price or fixed-price-incentive contracts for ship or boat construction and conversion. Over 90 per cent of current Bureau construction and conversion contracts are of these latter forms, and the term "contract change" used in this paper refers to proposed modifications to fixed-price forms of contract.

The usual scope of such contracts requires the shipbuilder to construct the vessel in accordance with referenced Government-furnished contract plans and specifications and to deliver the finished vessel, together with its equipment and outfit, to a place and within the construction time period prescribed in the contract.

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[6] An excellent statement of the role of the Defense Contract Audit Agency is contained in "What Role Will Audit Agency Perform in Defense Procurement?" Armed Forces Management, February, 1966, p. 61.

Firm fixed-price contracts. --In the case of firm fixed-price contracts, a firm price is specified in the contract for the scope of work. This price is subject to adjustment only for Government-authorized changes to the vessel during the period of its construction under the "changes article" and--in most cases--for increases or decreases in labor rates or material prices during the period of contract performance.[7]

Fixed-price incentive contracts. --In the case of fixed-price incentive contracts, a target cost, target profit, ceiling price, and profit adjustment formula are specified in the contract. Final price consists of final costs (as determined by audit and negotiation), and final profit which is determined by the relationship between final cost and target cost in accordance with the established profit formula. In cases where final cost is below target cost, the profit formula rewards the contractor with a final profit in excess of the original target. In cases where final cost exceeds target cost, the contractor's final profit is normally less than the target amount in accordance with the profit formula. In any case, however, final price--including final cost and adjusted profit--may not exceed the specific ceiling price established initially in the contract. As in the case of firm fixed-price contracts, the ceiling price and target price are subject to adjustment for Government-authorized changes to the vessel during the construction

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[7] U.S., Department of Defense, Armed Services Procurement Regulations, Paragraph 7-103.2, prescribes the "changes article" for fixed-price contracts. The Bureau clause is essentially the same as the ASPR clause.

period under the "changes article" and also normally have labor and material escalation features.[8]

Rights and obligations. --The rights and obligations of the parties to ship construction and conversion contracts are governed by the written provisions of the contract itself and the approved plans and specifications which are referenced in the contract. To the extent that any inconsistency exists between plans and specifications on the one hand and contract provisions on the other, the contract provisions govern. In the event of any inconsistency between the plans and specifications, the specifications govern. Further, silence of the specifications relative to any details shown on the plans, or failure of the plans to depict all details covered by the specifications, is not treated as an inconsistency under the terms of the contract. Finally, the contracts specify that "no charges shall be allowed or paid except with the expressed terms of . . . /this/ . . . contract or a written amendment thereof."[9]

Bilateral amendments. --The contracts may be amended by bilateral agreement of the parties at any time during the performance period. In addition, the Government reserves the right, by virtue of specific clauses in the contract, to make certain unilateral changes in the contract.

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[8]The changes article for fixed-price incentive contracts is similar to the fixed-price article.

[9]U.S., Navy Department, Bureau of Ships, General Contract Provisions, BUSHIPS Vessel Form, March, 1965, Clause 2.

Changes clause. --The origination and intent of the Changes Clause in Navy shipbuilding contracts is discussed in the second edition of Navy Contract Law as follows:

> The necessity for incorporating design improvements in naval vessels while under construction became apparent as long ago as the Civil War, as evidenced by the numerous changes made in the iron-clad ETLAH during its construction. The contractual arrangement then adopted as the most practicable for meeting this need was the reservation in a shipbuilding contract of a right in the Government to make unilateral changes in the plans and specifications at any time during the progress of the work. Such a reservation has come to be referred to as the "Changes" clause. This type of clause has proved so valuable that it is presently standard boilerplate, not only in shipbuilding contracts, but also in almost every Government contract. [10]

The clause referred to in this quotation, as presently included in Bureau construction and conversion contracts, provides that the Government, by written order, may make unilateral changes within the general scope of the contract in the following areas:

1. Plans, drawings, design, or specifications
2. Method of shipment or packing
3. Place of delivery.

The contractor is obliged to perform the contract as changed upon receipt of the written change order. After the change has been ordered, both the contractor and the Government are entitled to an appropriate equitable adjustment in the contract price or delivery schedule, or both, if the change causes an increase or decrease in the cost of performance or in

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[10] U. S. Navy, Office of the General Counsel, Navy Department, Navy Contract Law, NAVEXOS 1995, p. 532.

the time required for performance of any part of the work under the contract, whether changed or not changed by the order. The contractor must submit his proposal (claim) for adjustment to the contract price or delivery within 45 days after receipt of the change unless the Government Contracting Officer has extended the time for submission for cause and so justified his extension in writing.[11]

It should be emphasized, however, that a change order which " . . . materially alters the character or scope of the contract, or expands the contract to include additional work to any considerable degree . . . ceases to be unilateral and becomes the subject for a bilateral agreement to which the contractor must agree."[12] Consequently, if the Government forces a contractor to comply with an invalid change order of this nature, the contractor may seek to recover damages for breach of contract.

Other bases for contract changes. --In addition to the changes clause, Bureau construction and conversion contracts include other clauses under which the Government may unilaterally modify contract requirements. Price and delivery adjustments under these clauses are ordinarily made under the procedural requirements of the changes clause. Contract modifications allowed by these other clauses include:

1. Increases or decreases in the amounts or types of Government-furnished material.

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[11] While the standard clause specifies thirty days, ASPR 7-103-2 permits variations of this period.

[12] Navy Contract Law, p. 534.

2. Repairs to Government-furnished material.

3. Repairs, at Government expense, in accordance with the liability provisions of the contract.

4. Equitable extension of delivery dates or a change in contract price (or both) in the event Government-furnished material is not furnished at the time specified in the contract.

5. Handling, packing, and shipment by the contractor of Government property.

6. Special plant protection.

7. Assumption of risk or loss by the Government in accordance with the insurance article of the contract.

8. Repairs to ships under conversion contracts.

Definition and Origin of Changes

The regulations, instruction manuals, and written directives issued by the Bureau concerning the administration of contract changes utilize a common set of terms to define the various types and states of contract change actions. A knowledge of these terms, at least the basic ones, is essential to any examination or analytical review of the Change System. Some of the more basic terms and their definitions used by the Bureau--and within this paper--as defined by the Bureau of Ships' Shipbuilding and Boat Building Contract Manual,[13] are:

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[13] SUPSHIPS Manual, para. 12-1.1.

Term	Definition
Change	When used without qualification, this term means a proposed modification to a contract which could be effected, under the terms of the contract, either as (a) a unilateral change order or (b) a bilateral supplemental agreement.
Change Order	This term means a written order signed by the Contracting Officer, directing the contractor to make changes which the Changes Clause of the contract authorizes the Government to order without the consent of the contractor.
Supplemental Agreement	Any contract modification which is accomplished by the mutual action of the parties.
Contract Modification	This term denotes any alteration in the specifications, delivery point, rate of delivery, contract period, price, quantity, or other contract provisions of an existing contract, whether accomplished by unilateral action in accordance with a contract provision, or by mutual action of the parties to the contract. It includes (1) bilateral actions, such as supplemental agreements, and (2) unilateral actions, such as change orders.[14]

Origin of Changes

Changes are effected for a variety of reasons, ranging from a major change in the mission or characteristics of a ship, as determined by the Ship Characteristics Board, to a simple administrative clarification. Because of constantly evolving technology and the relatively long construction period involved, a large number of specification changes are normally originated by the Government during the contract performance period.

Depending upon their nature, changes may be originated at either headquarters (Bureau) or field (SUPSHIP) level. Under certain

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[14] Ibid., para. 12-5.2.2.

circumstances the change may even be originated by the prospective commanding officer of the ship under construction or by the contractor. Those issued by the Bureau are termed "Bureau Changes"; those which may be initiated by SUPSHIPS are called "Field Changes."[15]

Bureau changes. --Changes initiated by the Bureau normally involve a specification change and are grouped into three categories:

1. Category "A" change--Must Be Done. --Changes in this category involve items that affect the ship's ability to perform her mission or reflect necessary technical improvements for military reliability, safety, and significant operational features. Category "A" changes may be issued only when the change must be made during conversion or construction in order to produce an acceptable ship, as opposed to a later modification incorporated after delivery.

2. Category "B" change--Should Be Done. --Category "B" changes cover alterations that will ultimately be incorporated in the ship, either during the construction or conversion period or at a later date. The decision to incorporate Category "B" changes during construction--or conversely to defer an alteration to a later opportunity--is made by SUPSHIP. The SUPSHIP is given this discretionary responsibility presumably because he knows the exact status of the work and therefore is in a better current position than

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[15] SUPSHIPS Manual, para. 12-5, provides a detailed description of the origin and definition of the various types of changes.

the Bureau to assess the consequences of a change. This decision is based on serving the "best interests of the Government--cost, delay, and other factors considered," or on more specific, additional criteria forwarded to SUPSHIP by the Bureau.[16]

In the event SUPSHIP determines that the Government's best interests are not served by incorporating the alteration during construction, Bureau procedures require him to return the change to the Bureau for later issuance as a ship alteration.

3. Category "D" change--No Cost or Decrease Cost. --Changes in this category are to cover items that are acceptable to the Bureau under conditions of a contract price decrease or at no change in contract price and at no change in delivery, and which can be reasonably expected to be acceptable to the contractor under the same conditions. Decrease cost or no cost changes are issued for a variety of purposes, but are normally restricted to the following circumstances by Bureau regulations:

(a) Editorial corrections to specifications.

(b) Minor rearrangements.

(c) Amplification of specification wording.

(d) Substitution of items or materials of similar nature involving minor or no differences in cost.

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[16] Ibid., para. 12-5.2.2. It should be noted, however, that a comparative cost for incorporating a Category "B" change at a later date as an alteration is not provided SUPSHIP to assist him in making this decision.

(e) Minor changes in either methods or practices to suit the usage of a particular shipbuilder, when these changes are acceptable to the Bureau.

(f) Modification of specifications to reflect minor technical instruction changes.

(g) Items proposed by the contractor at "no cost" when accepted as such by the Bureau.

As in the case of Category "B" changes, the decision to issue a Category "D" change is made by SUPSHIP based on the "best interests" concept and any amplifying instructions from the Bureau. In the event he elects not to issue the change, he simply returns the change to the Bureau together with his justification for such action.

Field changes. --Authority to issue field changes is delegated to SUPSHIPS by the Chief of the Bureau for certain types of change items. This authority, however, is restricted to the following categories which generally do not involve specification changes:

1. Repairs or changes to Government-furnished material or equipment to make it suitable for its intended use.

2. Accomplishment of authorized Government-responsible trial items of work not required by the contract.

3. Repairs to existing parts and components of a ship under a conversion contract.

4. Correction of Government-responsible design defects in systems or components which, if not corrected, would prevent operation in accordance with specifications.

5. Value Engineering changes, subject to Bureau approval for specific types of changes.

6. Packaging, preparation for delivery, or other action related to disposal of Government-furnished material.

7. Contractor-responsible defects and deficiencies not required to be corrected by the contractor.

8. No cost or reduced cost changes not involving specifications.

9. Insurance claims which are payable by the Government under the terms of the contract (prior clearance must be obtained from the Office of the Chief of Naval Material).

10. Correction of design deficiencies that are considered essential by the prospective commanding officer of the ship under construction and concurred in by SUPSHIP, provided each change does not exceed $5,000 per ship and is of the type normally considered as an alteration.

11. So-called "Polaris" changes which are unique because of their Fleet Ballistic Missile features. Such changes may not be issued by SUPSHIPS if they exceed $50,000 in estimated price, affect basic ship characteristics, or jeopardize delivery dates.

12. Changes to incorporate provisions of mandatory, Government-furnished "non-deviation" plans related to the Submarine Safety Program.

13. Changes specifically authorized for field issuance by Bureau directives.

Control of change origination. --The general intent of the Navy Department with regard to restricting the origination of changes is characterized by the following excerpt from the Bureau's manual for administering ship construction and conversion contracts:

> It is the policy of the Chief of Naval Operations that every effort will be made to adhere as closely as possible to the original estimate of cost of construction and conversion of ships, and that only essential changes to the original design, which will give "order of magnitude" improvement to combat characteristics of ships are to be approved. [17]

To ensure that changes are issued in accordance with Navy policy, a Change Review Board, consisting of the Deputy Chief of the Bureau of Ships as chairman and three Assistant Chiefs as members, reviews all proposed Bureau-initiated changes estimated at $10,000 or more per ship. [18] In addition, the Change Review Board reviews:

1. Substantive prospective changes to contract specifications for ships.

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[17] SUPSHIPS Manual, para. 12-5. 1c.

[18] U. S. Navy, Bureau of Ships Instruction 4730. 1, prescribes the mission and precepts of the Change Review Board.

2. Changes involving unproven equipment contemplated for future ship specifications or already specified for ships.

3. When directed by the Chief of the Bureau, such other substantive changes which may be of importance to current or future ship construction costs.

All proposed changes under an estimated cost of $10,000 are reviewed by a Change Review Sub-Board, consisting of five Navy captains attached to the Bureau.

The Bureau has no formal procedures for reviewing changes initiated by SUPSHIPS, other than the general authority of the Bureau's Inspector General to review all operations of field activities. Local SUPSHIPS instructions reviewed by the writer indicate that the Supervisor reviews field changes issued by his own office, however, and copies of all resultant contract modifications must be submitted to the Bureau.

CHAPTER II

EXAMINATION OF THE SYSTEM

The purpose of this chapter is to examine the system designed and currently utilized by the Bureau for the administration of changes to fixed-price forms of ship construction and conversion contracts in order to gain insight into those policies which determine the system's design. The objective is one of identification and familiarization rather than analysis. Analytical examination has been reserved for Chapter IV.

Description of Existing System

Determination of the Method Used To Issue a Change

The Change System first becomes operative upon receipt of a change by the SUPSHIP for issuance. Although the changes clause permits the Government to issue unilateral change orders in several broad categories, it does not necessarily follow that the change order procedure is the most appropriate or desirable method. Any change to the contract may also be accomplished by a bilateral agreement between the contractor and the Government, provided the modification relates to work within the original scope of the contract and both parties receive adequate consideration. Hence, anything which may be accomplished by a change order may be accomplished by a supplemental (bilateral) agreement, but not conversely.

In those cases where the Government has the option of issuing either a change order or a supplemental agreement, the SUPSHIPS Manual states that "the decision to use a change order or supplemental agreement is left to the judgment of the Contracting Officer after considering all matters involved."[1] The "matters involved," according to the same Manual, "usually . . . involve the weighing of time and money."[2]

The importance of this judgment and the resultant decisions cannot be overemphasized. The method chosen to issue the change determines the procedures which the system prescribes for processing the change and there is a wide variance between the effort associated with processing a change order and that required for a supplemental agreement.

Recognizing the importance of this decision, the SUPSHIPS Manual also states:

> If it is feasible to negotiate in advance the effect upon pricing and delivery of the contemplated change, it is generally appropriate to effect the change by supplemental agreement. This has the additional advantage of accomplishing both the change and the resulting pricing terms, or time of delivery adjustment, by the use of a single document, which is agreed to and signed by both parties.[3]

The Bureau Instruction that establishes procedures for processing changes under shipbuilding contracts contains similar (but seemingly more restrictive) policy with regard to the use of change orders:

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[1] SUPSHIPS Manual, para. 12-2.2 (d).

[2] Ibid., para. 12-2.2 (c).

[3] Ibid.

> The change should be priced prior to issue unless the Negotiator determines in writing, and so justifies, that the work covered by the change must start before pricing in order to meet required schedules or in order to keep the cost of performing the change to a minimum.[4]
>
> . . . . . .
>
> An unpriced supplemental agreement or change order is appropriate only in those instances where the delay in starting the work required by the change due to the time required for pricing the supplemental agreement (1) can be expected to increase the price for accomplishing the change, or (2) can be expected to result in an unacceptable extension in delivery. The use of an unpriced supplemental agreement . . . shall be justified in writing.[5]

Category "A" Changes

Category "A" changes, because of their urgent nature, are usually issued as change orders by SUPSHIPS at the earliest possible date after receipt. In some cases the Bureau may elect to process the change as a supplemental agreement, rather than a change order, particularly if the change is of significant magnitude. In these latter cases, any negotiated pricing action is normally handled by the Bureau rather than by SUPSHIP, unless specific authority is otherwise delegated to SUPSHIP. Category "A" changes originated by the Bureau for SUPSHIP execution are forwarded by SUPSHIP to the contractor, accompanied by a change order or a proposed supplemental agreement.

Specific Bureau policy provided SUPSHIPS as a basis for determining the method for issuing a given Category A" change is as follows:

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[4]U. S. Navy, Bureau of Ships Instruction 4280. 1, September 30, 1964, p. 4.

[5]Ibid., p. 9.

> Bureau Category "A" changes . . . are usually issued as change orders since they involve things that must be done and, therefore, should be effected as soon as feasible so as not to delay the delivery of the vessels and so that their effect upon the contractor's cost of performance can be minimized to the extent possible. [6]

Category "B" Changes and Field Changes

As discussed in Chapter I, a Category "B" change involves a decision whether to issue or defer the change, as well as a choice of method used to issue the change. Assuming a decision is made to issue the change, the urgency attached to the work is less than that of a Category "A" change. The Contracting Officer may issue a Category "B" change as a change order or a supplementary agreement, whichever is considered more advantageous. The same flexibility and decision-making criteria apply to Field Changes. Specific Bureau policy states:

> . . . The Contracting Officer usually has more flexibility in deciding whether to use a change order or supplemental agreement. For example, in the case of a Category "B" change initiated by the Bureau, the Contracting Officer may determine after an informal discussion with the contractor that the change would not delay delivery, that the change in contract price would be reasonable, and that it could be negotiated prior to the issuance of a change. In this case the price should be negotiated and a supplemental agreement executed. In another case, the Contracting Officer and the contractor might agree (1) that there would be no change in delivery if the change were issued at an early date and (2) that although the cost of performance would be reasonable, it would be more expensive to hold off performance until the price adjustment could be negotiated. In this case, it would be in order for the change to be effected by a supplemental agreement providing for no change in delivery and leaving the equitable adjustment in price for later agreement. [7]

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[6] SUPSHIPS Manual, par. 12-2.2 (d). [7] Ibid.

Category "D" Changes

If a decision is made to issue a Category "D" Change, Bureau regulations emphasize the use of a supplemental agreement:

> The general rule is that the change should be effected by a supplemental agreement reflecting a decrease or no change in price and no change in delivery date; however, the Contracting Officer /SUPSHIP/ may issue a change order if it is impractical to handle the matter by such a supplemental agreement and he is reasonably sure that the contractor will subsequently execute a supplemental agreement covering the adjudication of the change order on the same basis.[8]
>
> . . . . . .
>
> A supplemental agreement may be used to issue a decrease cost change and obtain the contractor's agreement that there will be a downward adjustment in price adjudicated at a later date . . .[9]

Processing of Changes

General

In addition to the policies and guidelines set forth in SUPSHIPS Manual covering the method used to issue changes, the Bureau, in September, 1964, issued a specific written instruction for use by SUPSHIPS in processing changes under shipbuilding and conversion contracts.[10] This instruction prescribes in some detail the steps which are to be taken by SUPSHIPS in processing a change. Its self-stated purposes are to:

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[8] Ibid., para. 12-5.3.3 (c).

[9] Ibid., para. 12-2.2 (f).

[10] Bureau of Ships Instruction 4280.1, op. cit.

1. Stress the importance of the subject function (processing of changes under Bureau vessel contracts).

2. Provide procedures for use by addressees in processing changes under Bureau vessel contracts, with particular emphasis on:

(a) Evaluating contractor's proposed price adjustments.

(b) Obtaining advisory audit reports.

As mentioned in the Introduction, the reasonableness of price adjustments for change orders or supplemental agreements is not within the scope of this paper. Policies established to enhance the Government's ability to negotiate reasonable prices are directly related to the subject of this paper, however, in so far as they dictate the methods and procedures utilized in the overall change processing system.

Bureau Procedures

Since the overwhelming majority of both Bureau changes and Field changes are processed by cognizant field activities, Bureau policies and procedures are primarily directed toward SUPSHIPS. While they cover only the essential steps and matters which must be considered in processing a change, they are sufficiently detailed to establish a definite methodology which is consistently followed by all SUPSHIPS.[11]

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[11] Conformance with Bureau procedures is periodically verified by Bureau inspection teams.

As discussed later in this chapter, local procedures are commonly issued by SUPSHIPS. Bureau policy prescribes that the Contract and Materials Department shall be the lead department in the SUPSHIP office for processing changes. Consequently, the responsibility for preparation of local procedures for SUPSHIP approval is normally assigned to the Contract and Material Officer. Such local requirements which conflict with Bureau-prescribed procedures must be approved by the Bureau prior to their implementation.

The total system for administering changes is an involved process, requiring a number of individual operations. Hence, it is considered appropriate to describe the total system into four sequential phases in order to facilitate an understanding of its procedural requirements.

Pre-issuance phase. --This phase starts upon receipt by SUPSHIP of a Bureau change, or upon initiation of a Field change, and ends with the issuance of a request for proposal or a contract modification. The main functions in this phase are to:

1. Establish that the proposed change is contractually adequate, within the scope of the contract and within the delegated authority of the SUPSHIP Contracting Officer.

2. Ensure that the proposed change is technically adequate and sufficiently descriptive to permit a reasonable estimate of the work involved.

3. Determine if it is technically desirable to incorporate Category "B" and "D" changes at the current stage of construction or conversion.

4. Develop a Government price estimate for incorporating a change, or changes, for financial obligation purposes.

5. Select the most advantageous method for processing a change--e.g., change order, priced supplemental agreement, or unpriced supplemental agreement.

6. Establish a time schedule for processing the change, including target dates for individual key steps.

Although Bureau policy emphasizes the negotiating team concept in processing changes, governing instructions emphasize the fact that the technical functions and negotiating functions should be kept separate within the SUPSHIP organization.[12] Hence, the above functions are independently performed by different persons, each with the specialized capabilities required to carry out his function.

The negotiator performs the first function, which involves the contractual aspects of the change, then forwards the change to a technical analyst in the Planning and Estimating Department. The technical analyst checks the technical adequacy of the change and determines the technical desirability of incorporating Category "B" and "D" changes. Questions of

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[12] Bureau of Ships Instruction 4280.1, op. cit., p. 5.

substance are resolved by the technical analyst with his Bureau counterpart. If the change is Category "A," or if he considers it technically desirable to incorporate a "B" or "D" change, he returns it to the negotiator together with his recommendations for (1) any necessary technical revisions which have been previously agreed to by the originator, (2) the estimated price adjustment, (3) the method of issuance, and (4) the time schedule for processing. Upon receipt of the technical analyst's recommendations, the negotiator establishes the target dates for key events, decides upon the method of issuing the change, and prepares the necessary request for proposal or contract modification for transmittal to the contractor.

The decisions made in the pre-issuance phase set the stage for all subsequent steps in the total processing system. Therefore, the Contracting Officer should be assured that any change he issues will be clear to the contractor and properly expresses the intent of the Government. If the change does not adequately express the Government's intent, or if it is otherwise insufficiently clear to the contractor, such conditions will result in extraordinary effort on the part of both parties in the ensuing phases. Government price estimates, which contribute to the basis for the Contracting Officer's negotiation position, can also be a source of additional effort if they differ inordinately from a contractor's price proposal, indicating the existence of a possible misunderstanding between the parties with regard to the scope of the work required. Lastly, the method of issuance of the change determines to a significant extent the processing workload for both

SUPSHIP and the contractor, since the use of a change order requires further issuance of a contract modification order to finally adjudicate and complete the processing of a change--in effect, a significant duplication of processing operations.

Pre-proposal phase. --This stage covers the period from the contractor's receipt of a modification or request for proposal to the submission of a proposal to SUPSHIP.

In the case of pre-priced contract modifications, actual work is not commenced until the modification is adjudicated and executed. When the change is issued as an unpriced supplemental agreement or change order, the contractor commences the work as soon as its scope is clearly understood and it is technically feasible to perform in terms of the overall construction sequence and schedule.

The primary functions of the pre-proposal phase are to obtain from the contractor:

1. An acceptable, detailed scope of work which adequately discloses the elements of work to be accomplished.

2. His proposed increase or decrease in contract price and/or delivery as a result of the change.

The problems associated with these functions are inherently difficult. Clearly, before a contractor can reasonably commence work or propose an estimate of the cost of performing a change, there must be an understanding with SUPSHIP concerning the scope of work involved.

Similarly, the SUPSHIP evaluation of the scope of work and the contractor's price estimate cannot be conducted realistically until all scope issues are resolved to the satisfaction of both parties. Reaching an early understanding of this nature is a principal factor in the ease and timeliness of processing changes. The Bureau instructions to SUPSHIPS state in this respect:

> In the case of unpriced supplemental agreements, a scope understanding should, if practical, be reached with the contractor prior to issuance.[13]

It should be noted that the difference between the wording of a change order or supplemental agreement issued by the Government and what is referred to herein as "scope" of work (prepared by the contractor) is both genuine and significant. A change, in either format, prescribes the general intent of the Government with regard to changes in contract specifications or mandatory plans. The scope of work, on the other hand, describes in some detail the actual effect of the change on contract specifications, mandatory plans, and previously approved plans. It also involves a description of the work necessary to carry out the intent of the change.

Procedurally, the contractor first prepares the scope of the change and submits it to SUPSHIP for review. The technical analyst then reviews the scope for adequacy and for conformity with the intent of the change. If questions are raised by the technical analyst, a "scope conference" is convened with the contractor for the purpose of reaching an understanding.[14]

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[13] Bureau of Ships Instruction 4280.1, op. cit., p. 10.

[14] Ibid., p. 11.

If a complete understanding cannot be reached, the representatives prepare a statement describing the areas of difference for consideration during the negotiation of the price adjustment. If the technical analyst considers the scope satisfactory, he so advises the SUPSHIP negotiator who, in turn, advises the contractor of its acceptability. The date by which the contractor will submit his price proposal for the change is also established at this time by mutual agreement of the parties. Proposals must be submitted within 45 days of the issuance of a change (in accordance with the changes clause) unless an extension is granted and justified by the Contracting Officer in writing.

The next step in the pre-proposal phase is obtaining the price proposal for the work from the contractor. The nature of the price estimate contained in the contractor's proposal involves one of the essential requirements in the negotiation of any Department of Defense pricing action--specifically, the evaluation of the contractor's cost or pricing data as required to implement Public Law 87-653.[15] Termed the "Truth in Negotiation Law," this amendment to the United States Code specifies (1) that a Government negotiator must obtain from the contractor certified cost or pricing data to support any proposed price over $100,000, in cases where competition is inadequate to ensure a reasonable price, and (2) that such price proposals must be evaluated by the Government by means of the "cost analysis

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[15] Public Law 87-653 amended 10 USC § 2304, formerly known, in part, as the Armed Services Procurement Act of 1947.

technique.[16]

Changes are essentially proprietary actions with no competitive elements present. The effect of the amendment on change actions, therefore, is to require the contractor, for all changes in excess of $100,000, to provide SUPSHIP with (1) a detailed breakdown of all elements of his estimated cost together with his anticipated profit and (2) a certificate to the effect that the data provided are complete, accurate, current, and truly reflective of his books and records. The Bureau has extended this requirement to all proposals, regardless of amount, and has also prescribed the general format and content of the contractor's price proposals.

To facilitate Government cost analysis of a contractor's price proposal, the Bureau also requires that SUPSHIPS reach an understanding with the contractor regarding the procedures and practices to be followed in estimating the price adjustment for each change. To aid in reaching such an understanding, the Bureau policy requires SUPSHIPS to obtain a written description of the contractor's estimating system, which is subsequently

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[16]The requirements of PL 87-653 are implemented principally in ASPR, Chapter 3. ASPR 3-807.2 (c) defines cost analysis as the process of: (a) obtaining a breakdown of cost from the contractor; (b) the appropriate verification of cost data; (c) the evaluation of specific elements of cost; and (d) the projection of these data to determine the effect in price of such factors as:

(1) The necessity for certain costs.

(2) The reasonableness of amounts estimated for the necessary costs.

(3) Allowances for contingencies.

(4) The basis used for allocation of overhead costs.

(5) The appropriateness of allocations of particular overhead costs to the proposed contract.

verified and reviewed by the local Government audit office. Each proposal submitted by the contractor must be accompanied by a certification to the effect that the "understood" procedures were followed by the contractor in the preparation of the proposal.

Proposal analysis phase. --This phase covers the period from receipt of the contractor's proposal to the commencement of actual price negotiations. The primary functions to be performed are:

1. A review of the proposal for adequacy and compliance.

2. Obtaining of a government audit of the proposal when necessary.

3. Cost analysis of the proposed price in terms of the technical analyst's position, the audit findings, and the content of the proposal itself.

4. Establishment of a plan for adjudication, including key dates and the Government's initial negotiating position.

Upon receiving the contractor's proposal, the negotiator reviews it for conformance with the approved format, checks it for mathematical accuracy, and determines the amount of the proposal. Subsequent SUPSHIP cost analysis of the proposal centers around two advisory reports--that of the technical analyst and the results of a Government audit.

A technical evaluation is required for each proposal regardless of its dollar value in order to establish the acceptability and reasonableness of labor hours, material, and any extension in delivery dates contained in

the proposal. The technical evaluation of the labor hours and material is made on the basis of the contractor's facilities, work practices, and efficiencies. If the proposal includes costs associated with rip-out or work disruption which involves knowledge of the status of construction, the SUPSHIP Inspection Department is assigned to inspect the work to assist in evaluating the reasonableness of the proposal. Similarly, personnel of the Design Division are consulted on specialized engineering aspects of the change. A technical advisory report is prepared by the analyst which reflects his professional judgment of the reasonableness of the manhours and material estimates contained in the proposal and the contractor's backup data used in preparing the proposal. If the technical analyst is satisfied that the proposed labor hours and material are reasonable, the report so states. If in his opinion the estimates are too high or low in any area, the report reflects the differences together with the data to support the specific differences.

If the price of the proposal is less than $50,000, a specific Government audit is not normally requested unless questions arise with regard to the labor and overhead rates used in the proposal. In these cases, the negotiator relies upon the labor and overhead rates which the auditor periodically examines for acceptability for pricing purposes during ensuing periods (usually quarterly).[17] If the gross value exceeds $50,000, a copy

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[17] Rates are proposed by the contractor for the various types of labor, for engineering and manufacturing overhead, and for general and administrative costs.

of the contractor's proposal is forwarded by the negotiator to the cognizant Government auditor for review. The auditor conducts such evaluations as are feasible prior to receipt of the technical advisory report. Upon receipt of the report, the auditor completes his analysis and prepares an audit advisory report for use by the negotiator. This report, in addition to an evaluation of labor and overhead rates projected for the period of work performance, may advise the negotiator with respect to the value of subcontracts, inclusion of return costs, duplicate charges, contingencies, and other factors influencing the reasonableness of price. Although some audit work can be initiated prior to receipt of the technical analysis, the audit report and the bulk of the audit work cannot be completed until the technical advisory report is in the hands of the auditor.

Upon receipt of the technical advisory report and--when called for--the audit advisory report, the negotiator is prepared to complete the cost analysis and to establish his prenegotiation position. This process involves the resolution of any questionable matters and the obtaining of additional support information from the contractor. After all such matters have been resolved, the negotiator must prepare a written prenegotiation position containing the basis for his stand on every item questioned in the two advisory reports. Note that the position is characterized by a critical analysis of the contractor's proposal rather than the formulation of an independent Government estimate for purposes of price negotiation.

Negotiation phase. --The negotiation phase covers the period from completion of the prenegotiation position until completion of negotiations with the contractor regarding the price adjustment and other matters to be included in the supplemental agreement, including the adjudication and execution of the agreement. The objective, of course, is to reach an equitable agreement which implements the intent of the change at a reasonable price adjustment and/or change in delivery date.

Negotiations with the contractor should be commenced within sixty days after receipt of an audit report. In the event this deadline is not met, Bureau instructions require the negotiator to request the contractor to revise his proposal in order to ensure that the most current information is available for analysis.[18] In any event, the actual negotiation process involves the resolution--or attempted resolution--of any differences between the negotiator's prenegotiation and the contractor's position. The negotiator is assisted in this process by the technical analyst and the auditor as necessary. These differences may be quickly resolved to the mutual satisfaction of both parties. They may also require lengthy explorations, additional supporting data, re-audit, more technical analysis, or even a reappraisal of the scope, another proposal, and a new prenegotiation position. The negotiations cannot be completed and the supplemental agreement

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[18]This procedure serves to fulfill the PL 87-653 requirement for the submission of "current" cost or pricing data.

adjudicated and signed, however, until both sides are in accord.[19] The work, meanwhile, is either held in abeyance or continued in an unpriced status depending upon the method of change issuance. The total lapse of time since issuance may even become cause for revising a previous decision to issue the change on a pre-priced basis in favor of an unpriced change order if the nature of the change or the impact of time of performance on ultimate costs so dictates. In some instances, the change may not be adjudicated until its performance is completed or even until the entire contract scope is performed and final contract payment is in order.

Bureau instructions also encourage the use of "Package Adjudication" to the maximum extent feasible in order to reduce workload.[20] This procedure involves the negotiation of a number of small dollar value changes in a package and the use of a single supplemental agreement to incorporate the change in the contract. Periodically, packages are processed in the same manner as individual changes, including technical analysis, advisory audits, and written prenegotiation positions. A total price is negotiated for the package and no breakdown of this total price is included in the supplementary agreement.

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[19] Failure to reach accord may result in dispute which is referred to the Armed Services Board of Contract Appeals. Under the terms of the contract, however, the work must be completed pending final settlement.

[20] Bureau of Ships Instruction 4280.1, op. cit., p. 23.

Upon completion of the negotiation, the Contracting Officer executes the supplemental agreement, documents his negotiation in a post-negotiation report, and obtains clearances prescribed by higher authority. The change is then considered fully processed.

CHAPTER III

APPRAISAL OF PERFORMANCE

Purpose and Objective

The introduction to this paper describes a serious management problem in the administration of contract changes and suggests that a comprehensive analysis of the change administration system would be a fruitful means to arrive at corrective measures. In order to perform such an analysis, however, it is necessary to determine whether or not the system is currently yielding satisfactory results by comparing performance with some reasonable standard. For, as one management analyst has stated:

> The operating effectiveness of an area under study can be best ascertained by a comparison of the present conditions with those that were intended by its design, policy, and procedures. [1]

This chapter seeks to appraise the effectiveness of system performance during calendar year 1965 by comparing its yield with reasonable standards in order to identify areas of weakness. Its objectives are to determine:

1. If the system is capable of effectively handling a normal, average workload.

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[1] Systems and Procedures: A Handbook for Business and Industry, edited by Victor Lazzaro (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1959), p. 97.

2. If the system is capable of handling the existing backlog in addition to normal workload.

Performance Effectiveness Criteria

The effectiveness of a system is a measure of the extent to which it yields a product which is what management wants when management needs it. In the case of the change administration system, the "what" criterion may be thought of in terms of the volume, quality, and necessity for the output; "when" is a function of the speed, or processing time, of the system. There are then four criteria by which the effectiveness of the Change System could be judged in terms of its output: volume, quality, necessity, and processing time. Of these four, necessity and quality may be eliminated from this appraisal, for the following reasons:

1. Necessity for these changes is determined by forces or persons exogeneous to the system itself and, once issued, their processing within the system constitutes a legal or contractual requirement.

2. The quality of each individual product of the system is not within the scope of this paper (see Introduction).

Hence, the performance effectiveness criteria used in this chapter are volume and processing time. As used here, volume may be defined, in the aggregate, as the number of completed units--changes--which the system successfully completes in a given unit of time. Processing time, as a parameter of the change administration system, can be construed as

a measure of the elapsed time which is taken to process a change from its receipt to final completion. Processing speed can also be examined in terms of individual system phases as well as total elapsed time.

It should be emphasized that the two criteria--volume and processing time--as defined here are not synonymous. Volume means the number of changes processed during a given period of time, while processing time is the elapsed number of days taken to complete the change or any phase of the processing system. Volume may be considered independent of backlog, while processing time may be highly dependent on the existence and size of a backlog.

In the case of the Change System, one further factor must be considered in appraising results: the relative complexity, and hence difficulty, of individual changes. Arriving at a method to rate changes by their difficulty in the strictest sense would require a review of each change by qualified, experienced engineers. For purposes of this appraisal, however, a reasonable approximation will suffice and the relationship between cost and complexity is considered a satisfactory index for categorizing changes by relative difficulty.

Source of Data

In December, 1963, the Bureau designed and implemented a mechanized reporting system for the purpose of monitoring and appraising SUPSHIPS performance in the administration of shipbuilding and conversion

contract changes.[2] This system requires all SUPSHIPS--sixteen during calendar year 1965--to submit to the Bureau a detailed monthly report reflecting the number, progress, and time-in-process of all changes on hand but not completed.

The information contained in these reports provides an ideal vehicle for identifying and appraising both volume and processing time. The reports contain statistical data on the entire current inventory of changes on hand (over 9,000), as well as similar data on the total population of changes received and completed during the period selected for appraisal of performance effectiveness. All statistics used in this chapter have been compiled from calendar year 1965 total population figures unless otherwise stated.

Volumetric Effectiveness

Volumetric effectiveness, as an independent criterion, can be reasonably ascertained by comparing actual performance during a period with an acceptable standard. The data utilized in this comparison reflect all changes received and processed during calendar year 1965. Changes received are categorized in terms of their estimated dollar value and completed changes in terms of their actual price in order to indicate relative degrees of complexity.

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[2] U. S. Navy, Bureau of Ships Instruction 4330. 34.

Standard

In the absence of any explicit design parameters, it may be reasonably assumed that the system standard for volumetric effectiveness is its ability to process successfully average input over a given period of time. In order to offset short-term variables, the period of time selected for observation and comparison should represent several processing cycles. Since a span of twelve months covers a minimum of three processing cycles, changes received during calendar year 1965 should serve as a reasonable volumetric standard for performance during the same period. Changes received during this period are described in Table 1. They are categorized

TABLE 1

CHANGES RECEIVED DURING CALENDAR YEAR 1965

(By quantity and estimated value in $000's)

	0-.9	1-9	10-49	50-99	100-	Total
Total Quantity	3,101	1,823	638	102	91	5,755
Monthly Average	258	152	53	9	8	480
Monthly Average Value	30	431	860	534	1,193	3,048
Percent Quantity	54	32	10	2	2	100
Percent Value	1	14	28	18	39	100

Source: Compiled from Bureau of Ships Monthly Report of Inventory of Changes on Hand, Period from January 1, 1965, through December 31, 1965.

by value to indicate relative complexity.

As depicted in Table 1, the system must be able to handle about 5,500 to 6,000 changes a year, or an average of 480 changes per month, in the approximate distribution of complexity which is indicated. This does not mean, of course, that each change will (or should) consume one year in process. The twelve-month period actually covers from three to four standard cycles, as will be shown later in this chapter.

Performance

Comparable system performance during the same period is indicated in Table 2. The existence of any backlog in this case is considered extraneous. Again, complexity is indicated by a breakdown in value.

TABLE 2

CHANGES PROCESSED TO COMPLETION DURING CALENDAR YEAR 1965
(By quantity and actual value in $000's)

	0-.9	1-9	10-49	50-99	100-	Total
Total Quantity	2,492	2,177	841	133	96	5,739
Monthly Average	208	181	70	11	8	478
Monthly Average Value	36	556	1,312	673	2,050	4,627
Percent Quantity	44	37	15	2	2	100
Percent Value	1	12	28	15	44	100

Source: As given for Table 1.

Comparison

Table 3 provides a ready means of comparing Table 2's performance figures with the standards depicted in Table 1.

TABLE 3

CHANGES RECEIVED VERSUS CHANGES PROCESSED DURING CALENDAR YEAR 1965

(By quantity, estimated value for receipts, and actual value for completion in $000's)

	0-.9	1-9	10-49	50-99	100-	Total
Quantity Received	3,101	1,823	638	102	91	5,755
Quantity Processed	2,492	2,177	841	133	96	5,739
Monthly Average Received	258	152	53	9	8	480
Monthly Average Processed	208	181	70	11	8	478
Percent Quantity Received	54	32	10	2	2	100
Percent Quantity Processed	44	37	15	2	2	100

Source: As given for Table 1.

Conclusions

It may be concluded from the preceding comparison that aggregate volumetric effectiveness is within the realm of reasonably satisfactory performance in terms of processing average normal workload introduced into the system during a representative year. It could also be concluded that changes of least complexity (0-.9 category) are not processed in sufficient quantity in relation to input, and, conversely, changes in the next two categories (1-9 and 10-49) are processed in quantities which are high in relation to input. These latter conclusions are not considered to have valid significance since they may very likely indicate the presence of an extraneous variable--the difference between estimated and actual values--in the lower, more restrictive, value categories.

The volume of changes processed, however, does not indicate any ability to process the existing inventory of over 9,000 changes under present conditions and procedures. In fact, if no new input were added to the system, it would still require over eighteen months to process this inventory at existing levels of performance.

Processing Time Effectiveness

In determining the aggregate effectiveness of a system in terms of processing time, total system performance must be identified and compared with some reasonable standard. In the event that aggregate performance is considered unsatisfactory, meaningful conclusions about processing time

effectiveness can best be arrived at through an analysis of the individual phases which constitute the total system.

Data utilized to identify performance reflect a compilation of all changes processed through the total system and its individual phases during the first eleven months of calendar year 1965.[3] It should be noted that the figures represent actual performance on the changes which were processed through a given phase, or through the entire system, and not the performance of a specifically identified group of changes as that group passed successively through each phase of the system.[4]

Standards

In the absence of an explicit, cardinal standard for measuring volumetric efficiency, a reasonable assumption was made--the system should be able at least to handle normal demand workload. In the case of processing time there are likewise no explicit standards, and a simple, implicit criterion is not available. Under these conditions, the determination of suitable standards is a highly subjective process. One prominent managerial academician made the following observation with regard to management standards:

> I do not know of any easy guideline which might be applied by a practicing manager to determine what standards he should have,

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[3]Data for December, 1965, were not available.

[4]The Bureau's reporting system does not lend itself to the identification or utilization of a "control group."

since election of standards seems to be predominately a matter of the managerial art.[5]

The question of processing time standards for the change administration system, however, may be posed constructively in the following terms:

1. What did the system designer want?

2. What external and internal criteria influenced system design in terms of its speed?

Standards may be synthesized, then, based on a reasonable consideration of these two questions provided the results are reinforced by the judgment of experienced personnel who utilize the system.[6]

In response to the first question, it may be assumed that standards should allow sufficient time for the existing resources to produce a product which meets quality standards. An examination of relevant sources results in the following answers to the second question:

1. The changes clause allows forty-five days after receipt of the notification of a change for submission of the contractor's proposal. Requests for extension of this period must be approved by the Contracting Officer in writing.

2. The changes clause also authorizes the Contracting Officer to act upon a claim at any time prior to final contract payment.

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[5]Harold Koontz, "A Preliminary Statement of Principles of Planning and Control," Journal of the Academy of Management, April, 1958, p. 58.

[6]Discussions were held between the author and five key members of the Bureau's Contract Division on the subject of acceptable standards.

3. SUPSHIPS Manual states that proposals should be adjudicated on the basis of estimates.[7] This implies prospective rather than retrospective pricing. The Manual further implies that each change should be evaluated to determine a reasonable time for completion.

4. The Bureau's instruction for processing changes states:

> The time allowed for completing the various steps in processing a change is to reflect the negotiator's best judgment of how long it should take to complete the step. He will have to consider such matters as the following in this connection:
>
> /complexity, difficulty in establishing scope, contractor's workload, SUPSHIPS' workload, difficulty of technical evaluation, requirement for audit./[8]

5. Bureau procedures require a technical advisory report for all changes and an audit advisory report for all changes of an estimated value of $50,000 or greater.[9]

6. Bureau procedures require a detailed cost analysis of the contractor's proposal for all changes.[10]

Considering these factors, and the nature of available performance data, rough approximations of processing time standards may be synthesized as follows:

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[7] SUPSHIPS Manual, para. 13-3.

[8] Bureau of Ships Instruction 4280.1, op. cit., p. 25.

[9] See pp. 45-46.

[10] See p. 42-43.

1. A significant period of time is necessary for the completion of an audit. Standards should be developed, therefore, for two general categories: changes less than an estimated value of $50,000 and those equal to or above that amount. This breakdown also serves to divide changes into two categories of complexity.

2. A further estimated evaluation of required time--based on discussions with experienced Bureau personnel--can be compared with performance reporting categories (prescribed by current Bureau policy) to arrive at reasonably conservative processing time standards. Table 4 depicts this process.

TABLE 4

SYNTHESIS OF PROCESSING TIME STANDARDS
(In average days)

	Changes Valued at					
	Less than $50,000			$50,000 or More		
	Estimated Period Required To Complete Phase	Analogous Performance Reporting Category	Synthesized Standard	Estimated Period Required To Complete Phase	Analogous Performance Reporting Category	Synthesized Standard
Issue Change	10[a]	10	10	10[a]	10	10
Obtain Proposal	45[b]	30 or 60	60	45[b]	30 or 60	60
Analyze Proposal	30[a]	30	30	50[d]	90	90
Negotiate	5[a]	10	10	15[b]	10 - 30	30
Total Time	90	90	90[c]	120	120	120[c]

[a] Estimates based on discussions with experienced Bureau personnel.

[b] Contractual allowance.

[c] Standards based on aggregate estimate rather than on sum of individual standards.

[d] Note that Bureau instructions require that new proposals must be obtained if period from receipt of audit to commencement of negotiations exceeds 60 days (see page 47).

Performance

Comparable system performance is described in Tables 5 through 9. Data are broken down into two valuation groups--changes valued at less than $50,000 and those valued at $50,000 or more--to permit subsequent comparison with standards. Broken lines represent the relative position of the standards previously synthesized in this chapter.

TABLE 5

AVERAGE TOTAL TIME TO PROCESS CHANGES
(Monthly average number of changes by days)

Changes Valued at					
Less than $50,000			$50,000 or More		
Days	Number of Changes	Cumulative Percentage of Total	Days	Number of Changes	Cumulative Percentage of Total
1- 30	56	12	1- 30	0	0
31- 60	44	22	31- 60	0	0
61- 90	43	32	61- 90	0	0
91-120	37	40	91-120	1	5
121-180	61	54	121-180	1	9
181-360	120	81	181-360	5	32
361-	88	100	361-	15	100
Total:	449		Total:	22	

Source: Compiled from Bureau of Ships Monthly Report of Inventory of Changes on Hand, Period from January 1, 1965, through November 30, 1965.

TABLE 6

AVERAGE TIME TO ISSUE CHANGES
(Monthly average number of changes by days)

Changes Valued at					
Less than $50,000			$50,000 or More		
Days	Number of Changes	Cumulative Percentage of Total	Days	Number of Changes	Cumulative Percentage of Total
1-10	287	53	1-10	13	57
11-30	157	81	11-30	6	83
31-60	56	91	31-60	2	91
61-90	24	96	61-90	1	96
91-	23	100	91-	1	100
Total:	547		Total:	23	

Source: As given for Table 5.

TABLE 7

AVERAGE TIME FOR CONTRACTOR TO SUBMIT PROPOSALS
(Monthly average number of changes by days)

Changes Valued at					
Less than $50,000			$50,000 or More		
Days	Number of Changes	Cumulative Percentage of Total	Days	Number of Changes	Cumulative Percentage of Total
1-30	154	29	1-30	1	2
31-60	79	44	31-60	4	10
61-90	47	53	61-90	3	16
91-	245	100	91-	42	100
Total:	525		Total:	50	

Source: As given for Table 5.

TABLE 8

AVERAGE TIME TO COMPLETE ANALYSIS OF PROPOSALS
(Monthly average number of changes by days)

Changes Valued at					
Less than $50,000			$50,000 or More		
Days	Number of Changes	Cumulative Percentage of Total	Days	Number of Changes	Cumulative Percentage of Total
1-30	256	63	1-30	8	35
31-60	38	72	31-60	2	44
61-90	24	78	61-90	2	52
91-	92	100	91-	11	100
Total:	410		Total:	23	

Source: As given for Table 5.

TABLE 9

AVERAGE TIME TAKEN TO NEGOTIATE PROPOSALS
(Monthly average number of changes by days)

Changes Valued at					
Less than $50,000			$50,000 or More		
Days	Number of Changes	Cumulative Percentage of Total	Days	Number of Changes	Cumulative Percentage of Total
1-10	225	50	1-10	13	52
21-30	113	75	21-30	7	80
31-60	62	89	31-60	2	88
61-90	16	93	61-90	1	93
91-	34	100	91-	2	100
Total:	450		Total:	25	

Source: As given for Table 5.

Comparison

A summary of the change order system processing time performance based on synthesized standards developed earlier in this chapter is contained below in Table 10.

TABLE 10

SUMMARY OF AVERAGE PROCESSING TIME PERFORMANCE BASED ON SYNTHESIZED STANDARDS

	Changes Valued at	
	Less than $50,000	$50,000 or More
	Percent Meeting Standard	Percent Meeting Standard
Total Processing Time to Completion	32	5
Time To Issue Changes	53	57
Time To Submit Proposals	44	10
Time To Analyze Proposals	63	44
Time To Negotiate Proposals	50	80

Conclusions

On the basis of this summary it may be concluded that the change order system is wholly inadequate to permit timely processing of changes

with available resources. Table 10 indicates that only 32 per cent of minor changes (below $50,000) and 5 per cent of major changes (over $50,000) are processed within acceptable standards. Table 5 shows that it takes over six months to process a little less than half the number of minor changes, and over one year to process more than half of the major changes.

A comparison of performance with standards in each of the system's phases discloses the following:

1. Negotiation of major changes is the phase which reflects best performance.

2. Performance in all other phases, for both major and minor changes, cannot be considered satisfactory from any reasonable standpoint.

3. Time required to obtain proposals is the phase where performance is least satisfactory. Ironically, this is the only phase where an explicit standard is available (contractual requirement for submission within 45 days of issuance), and the synthesized standard permits 15 additional days for completion of this phase.

Summary of Conclusions

Having appraised the Change System by comparing average performance over an extended period with performance standards which are either implicit or reasonably synthesized, the following conclusions may be summarized:

1. The system meets volumetric standards for effective performance based on the implicit objective of processing normal demand. This conclusion, however, does not of itself denote overall effectiveness since the performance period includes at least three standard cycling periods (three times the period considered necessary to process a given change).

2. The system is incapable of coping with significant perturbations in volumetric demand, such as the present backlog of unadjudicated changes.

3. The system does not meet processing time standards for effective performance synthesized from procedural requirements and the judgment of experienced personnel. It cannot be proven conclusively that this weakness is directly attributable to the backlog since the data do not reflect the progress of specifically identified changes. Nevertheless, the nature of the backlog, and the fact that the volumetric standards are effectively met, strongly suggest that its existence contributes heavily to inadequate processing time performance.[11]

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[11] See Appendix for data on the backlog existing at the end of calendar year 1965.

CHAPTER IV

EVALUATION OF CURRENT SYSTEM EFFICIENCY

Purpose and Objectives

The last chapter developed performance indices for the Change System, compared them with standards, and concluded that the system's weaknesses are:

1. It is incapable of handling a significant backlog of changes.
2. It does not process changes within an acceptable time period.

It was also noted that the system lacks explicit standards by which to measure performance effectiveness.

The purpose of this chapter is to evaluate the efficiency of the Change System. Its objective is to disclose means to improve system efficiency, thereby overcoming or lessening its weaknesses in performance.

Method

Systems analysis stresses the approach of increasing efficiency as a means to gain increased effectiveness. It may be likened in this respect to an internal streamlining process whereby resistance to system flow is reduced by shortening the length of the path and eliminating unnecessary constrictions. This must be done, of course, without intolerable sacrifice in the quality of the product.

In this analysis the entire system will be evaluated to determine if its governing policies may be eliminated, modified, simplified, or combined to improve system performance while remaining within the confines prescribed by law, regulation, or directives of higher authority.

The policies will be evaluated in relation to the following considerations:

1. If the policy has its derivation in law, regulation, or doctrine of higher authority, how does it compare with its determinant? To what extent does it affect efficiency? Can the policy be modified to permit greater efficiency without unduly detracting from the quality of the product and still comply with its determinant?

2. If the policy has its derivation solely in the Bureau, is its effect considered necessary to enhance the system's ability to yield an acceptable product? Can the policy be modified to permit greater efficiency without sacrificing adequate control of quality?

The answers to these questions may result in arriving at acceptable alternates to existing policies which permit a marked increase in system efficiency. They may also suggest additional policies which might be adopted as a means of increasing efficiency.

Assuming that acceptable, more efficient alternatives to existing policies are disclosed, the final step will be to combine them into a recommended system design which, if adopted, should result in a decisive

improvement in system performance. This recommendation is reserved for the final chapter.

Evaluation of System Policies

Chapter II described the existing Change System in sufficient detail to permit the identification of those policies which govern its procedures and operations. They have been extracted and summarized in this chapter in five categories for greater ease of reference and evaluation.[1]

1. Policies affecting the entire system.
2. Policies affecting the pre-issuance phase.
3. Policies affecting the pre-proposal phase.
4. Policies affecting the proposal analysis phase.
5. Policies affecting the negotiation phase.

If the evaluation discloses that a more efficient revision is necessary and feasible, an alternate policy has been proposed.

Policies Affecting the Entire System

Each of the policies evaluated below is related only indirectly to law, statute, or directive of higher command.

1. Policy. --The same basic system is prescribed for processing all changes, regardless of complexity or value. The only exceptions to this policy are (1) the relaxation of the requirement for auditing each minor

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[1] The derivation and documentation of policies is not repeated in this chapter.

change, (2) the relaxation of technical analysis requirements for proposals of "low value" and complexity, and (3) the use of "package adjudications" for "low value" changes. These three exceptions are discussed separately later in this chapter.

Discussion. --The concept of utilizing the same system for all changes appears inconsistent with the rational management approach of investing time and resources in relation to their expected benefits. An alternate system which allocates the resources of time and effort in some proportion to value should greatly increase efficiency. Table 2, Chapter III, indicates that 85 per cent of the changes received during the year were less than $10,000 each in estimated value, yet represented only 15 per cent of the total dollar value of changes received.

Suggested alternative. --Changes less than $10,000 (hereafter called high-volume changes) should be processed in a manner which is less burdensome than those above $10,000 (hereafter called high-value changes). The resultant savings in time and effort could be applied to high-value changes. Such an alternative system will be described in subsequent portions of this chapter devoted to the individual system phases.

2. Policy. --The "negotiating team" concept is required as the functional element of SUPSHIPS for processing changes.

Discussion. --The negotiating team is strictly a functional group which cuts across formal organizational lines. It is composed of representatives from the Contract and Materials Department, Planning and

Estimating Department, and the resident Government audit office. The members are physically located in separate offices and meet rarely except actually to negotiate with the contractor. Team membership frequently varies. The best qualified, most effective personnel are not necessarily assigned this type of work, at least not on a permanent basis. Hence, specialization is not promoted and its resultant efficiencies are not realized. Furthermore, nonperfunctory communications among the members are usually written; almost all communication with the contractor is written, since the contractor's organization is not normally housed in the same building.[2]

Suggested alternative. --Although the administration of contract changes is one of the primary continuing responsibilities of SUPSHIPS, the permanent organizational structure and physical arrangement do not reflect this fact. The establishment of a permanent Government negotiating team (or teams) in the same office space would tend to increase efficiency by promoting specialization and improving communication. It can be reasonably assumed that a similar permanent group within the contractor's organization would have a like effect and would therefore be in the best interests of both parties. Consideration should be given to a requirement for contractors to establish such a group as a requisite for future contract awards.[3]

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[2]Written communications are commonly delivered through a "mail room" distribution system and may take one or two days to reach their destination.

[3]Precedent exists for this type of requirement. Contracts now stipulate that the contractor will maintain certain organizational elements--e.g., a quality control group.

3. Policy. --SUPSHIPS are required to reach an understanding with the contractor in regard to:

(a) The method of estimating.

(b) Proposal format.

(c) The type and amount of data submitted by the contractor to support proposals.

Discussion. --This concept of fostering mutual understanding and utilization of standard methods and forms is considered to be a highly desirable and productive means of increasing efficiency. Inaugurated in September, 1964, Bureau and SUPSHIPS personnel consider this policy one of the significant improvements incorporated to date in the Change System.[4] No alternate is suggested.

4. Policy. --SUPSHIPS are required to establish target dates and report performance statistics for each change. No goals or standards have been established or suggested as a means of gauging satisfactory performance.

Discussion. --This system weakness was mentioned earlier as a conclusion reached in Chapter III. The use of individual target dates as standards is contrary to the concept of an objective evaluation and hampers any realistic form of comparative rating. The principle of "management by exception" cannot be employed, and higher management is forced to evaluate

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[4]Based on discussions with Bureau Contract Division branch head and section heads.

performance based on broad categories rather than by individual changes which can be reasonably labeled "troublemakers ' by all echelons of supervision.

Suggested alternative. --Establish standards for controlling and reporting similar to those synthesized in Chapter III. Revise the Bureau's change order reporting system to eliminate all data except (a) that related to exceptions from satisfactory performance and (b) a report of change in status of individual changes (if considered necessary for technical control).

Policy Affecting the Pre-issuance Phase

Policy. -- Only one basic policy governs the issuance phase: changes should be priced prior to issuance unless the negotiator justifies in writing that the work covered by the change must start before pricing in order to meet required schedules or in order to keep the cost of preparing a change to a minimum.

Discussion. --Although statistics are not available, discussion with Bureau personnel indicates that only about 10 per cent of the changes are issued after pricing.[5] The intent of this policy is to decrease the amount of post-priced changes. As discussed in Chapter II, pre-priced changes do not require the completion of the proposal, analysis, and negotiation phases after the fact, require relatively less processing, and do not

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[5]The Bureau reporting system does not yield statistical data on the change issuance method.

induce the ill effects of post-pricing. This policy is obviously consistent with the intent of the law and serves to increase overall system efficiency. It is considered desirable for high-volume changes as well as high-value changes. No alternative is suggested.

Policies Affecting the Pre-proposal Phase

The first two policies which govern this phase are internally derived; the last is a contractual requirement.

1. Policy. --An understanding of the scope of the change shall be reached between the SUPSHIP and the contractor as soon as possible, but in any event before the contractor proceeds with his proposal.

Discussion. --The intent of this policy undoubtedly is to avoid unnecessary duplication in preparing proposals. Nevertheless, it hampers system efficiency by eliminating the savings in time which might accrue by virtue of parallel effort. This loss of time should be weighed against the risk and effects of inadequate or inaccurate scope definition. This is also an instance where an indefinite, subjective performance standard is imposed.

Suggested alternative. --Parallel preparation of the scope and proposal should be permitted for high-volume changes. The savings in time gained should offset the time which might be lost by the necessity for revising proposals in the event the scope is inaccurate. The probability of scope differences, and the attendant effort in revising incorrect proposals preclude the application of this alternative to the relatively more complex

high-value category. It is also suggested that a definite time standard be established for the submission of change scopes based on their complexity as reflected by their estimated value.

2. Policy. --"Scope conferences" shall be convened if questions regarding scope arise and the negotiator deems they are warranted. These conferences should be attended by the technical analyst who will assist in negotiating the proposal.

Discussion. --It is generally recognized that conferences are an excellent--but time-consuming--form of communication. If they can be eliminated without sacrificing accuracy, processing time may be shortened.

Suggested alternative. --The suggested alternative regarding permanent Government and contractor negotiating teams, preferably housed in adjacent office space, should be effective in eliminating the need for most scope conferences. Informal discussions, summarily documented after the fact if need be, should be the main form of communication. This does not violate the "arm's length" principle, and conferences can be convened when this is the only acceptable alternative.

3. Policy. --The present contract form requires submission of a proposal within 45 days after receipt of a change unless written authority to extend this period is granted by the Government.

Discussion. --This is one of the few explicit standards in the Change System. Obviously its intent is to draw attention to "exceptions,"

as well as prescribe a requirement. Table 7, Chapter III, however, illustrated that the relatively few timely proposals are the true exceptions. "Batching" of proposals should improve efficiency.[6]

Suggested alternative. --Realistic, explicit time standards should be set for this phase on the basis of value. An exception to ASPR would be required to make this revision for future contracts. The time standards should be keyed to complexity. High-volume changes should be batched--preferably weekly, since a longer period may result in significant post-pricing--but price estimates should not be commingled if further complications are to be avoided.

Policies Affecting the Proposal Analysis Phase

With the advent of Public Law 87-653 (previously described in Chapter II) and the interest displayed by the Government audit office in the reasonableness of prices negotiated by SUPSHIPS for changes, a great deal of increased emphasis has been placed on analyses of proposals.[7] This is borne out by the relatively large body of policy which governs system

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[6]The term "batching" as used here is defined as the collection of data of a given type for group processing as opposed to individual processing of each element.

[7]As of September, 1965, the Government Accounting Office had submitted three reports to Congress disclosing deficiencies in change-order pricing practices at shipyards: B-146751, dated June 30, 1964; B-146898, dated October 16, 1964; and B-146990, dated September 20, 1965. Each report emphasized the need for more effective change-order pricing procedures and practices.

procedures and operations in the analysis phase. Each of the following policies has its origin in Public Law 87-653 and the Armed Services Procurement Regulations (ASPR).

1. Policy. --A price estimate shall not be used as the basis for pricing a change. Cost analysis, as described in ASPR, Chapter III, will be utilized in analyzing changes.

Discussion. --The ASPR reference is part of the implementation of Public Law 87-653. The reference, however, does not require cost analysis for pricing actions less than $100,000.[8] Below this amount, price analysis is permitted and in certain circumstances encouraged. Price analysis involves the comparison of a proposal which does not include the contractor's cost data with an independent government estimate and is a less time-consuming and onerous process. Requiring cost analysis for small value changes does not appear consistent within the law or ASPR. In fact, it may be considered a sacrifice of efficiency for added assurance of reasonable prices stemming, no doubt, to a great extent from Government Accounting Office criticism.

Suggested alternative. --High-volume changes should be subjected to price analysis rather than to cost analysis. Since SUPSHIPS are required to reach an understanding with regard to a basis for estimating, and since the format for proposals is also a matter of prior agreement,

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[8] ASPR, para. 3-807. The process of cost analysis is briefly described in Chapter II.

the risk of excess profits resulting from the use of price analysis techniques --either for individual changes or in the aggregate--would appear insignificant in the case of minor changes. Consideration should be given also to the possibility of using price analysis for changes less than $50,000, except in those cases where the negotiating team considers cost analysis necessary.

3. Policy. --A technical evaluation of each contractor's proposal is required and a written technical analysis report of each evaluation must be submitted to the negotiator.

Discussion. --The technical evaluation, as described in Chapter II, is a part of cost analysis technique. It involves a thorough and complete analysis of each technical element of cost (required man hours and material) in the contractor's proposal. It is a time-consuming task, often involving extensive review of additional supporting data which must be counted and submitted by the contractor. Aside from providing some additional assurance concerning this presence of a reasonable cost-price relationship, the technical evaluation's merit lies solely in the fact that the technical adequacy of the proposal is reviewed by government engineers.

Suggested alternative. --A technical evaluation should be performed, and a report submitted, only in cases where cost analysis is to be performed in accordance with the previous suggestion regarding the use of cost analysis. A review should nevertheless be made to check the technical adequacy of every proposal. This review could be made by a technical member of the permanent Government negotiating team.

3. Policy. --An audit must be performed on all change proposals valued at $50,000 or greater. Proposals below this amount should be audited on a selective sampling basis.

Discussion. --Although there is some controversy among Government contracting personnel concerning the need for an audit to perform cost analysis, there is general agreement to the effect that proposals valued at $100,000 or more should be audited in order to be consistent with the intent of ASPR.[9] A thorough audit of a proposal requires considerable effort. Depending on the complexity, audits may require thirty days or more to complete.[10] In addition to audits of specific proposals, the contractor's estimating rates for labor and overhead are also audited. It would seem that the overall audit program currently in effect--a combination of (1) audits of each proposal over $50,000, (2) selective audits of proposals below $50,000, and (3) rate audits and estimating system audits--is one of questionable necessity and dubious value.

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[9]ASPR, in paragraph 3-807, requires "cost analysis" on noncompetitive proposals over $100,000, and this is considered by many to imply the need for an audit. U.S. Navy, Office of the Chief of Naval Material, Navy Procurement Directives, para. 3-909, specifies $100,000 as the "general rule" for obtaining advisory audit reports. Secretary of Defense memorandum of April 10, 1964, to the Secretary of the Military Departments requires that an audit be made when a modification will exceed $250,000. In response to the aforementioned GPO reports, the Bureau instituted the policy of auditing proposals in excess of $50,000.

[10]Depending on workload and the complexity of the proposal, an audit normally requires from ten to sixty days, according to Bureau contracting personnel.

Suggested alternative. --Specific audits should be restricted to proposals of $100,000 or more. Proposals of lower value should be analyzed on the basis of periodically audited labor and overhead rates. Continue the selective sampling system for auditing proposals less than $100,000, as well as the periodic audit of the contractor's estimating system.

4. Policy. --Specific audits must be based on the technical analysis report.

Discussion. --It is generally recognized that auditors should not perform their analysis in a technical vacuum. This policy, however, has been generally interpreted to mean that the audit should be based on the technical analysis but conducted separately. Such an interpretation can result in series rather than parallel or coordinated effort, with a resultant loss in efficiency and time.

Suggested alternative. --In keeping with previous suggestions in this chapter, audits and technical analysis should be conducted jointly whenever the two are interdependent. Consideration should be given to the submission of a joint advisory report in cases where a specific audit is required.

5. Policy. --If the negotiation is not completed within sixty days after audit and/or technical advisory report, an updated proposal should be requested for analysis.

Discussion. --Public Law 87-653 requires the submission of "current" cost or pricing data by the contractor; the intent of this policy

is to enforce that requirement. The burden for submitting data, however, should be placed principally upon the contractor.[11]

Suggested alternative. --The aging of cost or pricing data commences with its preparation rather than with the completion of Government analysis. It is therefore suggested that this policy be revised to require the contractor to update his proposals (1) in cases where a measurable change in cost or pricing information occurs, or (2) within ninety days after submission in any event.

Policies Affecting
the Negotiating Phase

Only two policies which govern this phase will be evaluated. The remainder serve mainly to emphasize the fact that the Contracting Officer is responsible for negotiating a reasonable price and delivery adjustment in consideration for the change, including the disruptive impact which the change may have on work in process.

1. Policy. --Changes must be priced prior to the completion of a substantial portion of the work required by the change unless a delay in pricing is in the best interests of the Government.

Discussion. --The requirement for prospective pricing is inherent in fixed-price contracting and the essential benefits of the fixed-price concept are dissipated to the extent that retrospective pricing is employed.

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[11] The clear intent of the law is that the responsibility rests with the contractor to disclose such information rather than to produce it upon request.

Adoption of a more efficient Change System should serve to decrease the number of cases when retrospective pricing becomes a consideration. No alternative to this policy is considered necessary or desirable.

2. Policy. --"Package adjudication" of small dollar value changes shall be performed "to the maximum extent feasible."[12]

Discussion. --This policy is an attempt to relate the expenditure of time and effort to their resultant benefits. It is not adhered to by SUPSHIPS to any great extent. A restatement in definitive, more emphatic terms is necessary if the policy is to be of any significant value.

Suggested alternative. --All "high-volume" changes should be negotiated using the "package" technique. These changes should be batched and negotiated no oftener than weekly. Any retrospective pricing which results from the adoption of this suggested alternative should be so minimal as to be insignificant in terms of the total value of changes in process. "Batching" was previously suggested as a means of improving efficiency in the proposal stage. While the two suggestions are not necessarily dependent, adoption of both should increase overall system efficiency in a multiple manner.

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[12] Bureau of Ships Instruction 4280.1, op. cit., p. 23.

Conclusions

An evaluation of the policies which govern the Change System demonstrates that there are a significant number which result in the inefficient utilization of scarce resources--particularly time. In many cases the controls imposed by these policies go well beyond that which were intended by law or the regulations of higher command. In view of the General Accounting Office's past criticism of SUPSHIPS' pricing practices, this additional investment in control was presumably made with the intention of gaining greater assurance of negotiating reasonable prices for contract changes.

This chapter concludes that the Bureau, in seeking to strike a balance between the efficiency of the Change System and the quality of its product, has leaned perhaps too heavily on the side of quality. The effects of this over-emphasis are undoubtedly a major contributor to the lack of system effectiveness which was revealed in Chapter III.

The need for some revision in the Change System is clearly evident. This chapter concludes that certain policies may be revised--remaining well within the confines of law and regulation--to permit more timely processing without an unacceptable increase in risk. The resultant gain in efficiency may prove sufficient to enable the system to effectively handle normal demand without the necessity for additional personnel or a major revision in contractual policy.

This chapter, however, does not conclude that the system may be revised under the imposed constraints to permit the timely processing of

the present backlog of changes.[13] It is considered that this backlog represents an extraordinary perturbation in normal system demand and, as such, should be treated with extraordinary measures rather than by attempting to revise the system to accommodate its processing.

[13] See Appendix for data on the inventory of changes in the system on December 31, 1965.

CHAPTER V

RECOMMENDED SYSTEM DESIGN

Objective and Assumptions

Having concluded that it is possible to revise the system to achieve greater efficiency without unacceptable risk, it remains to complete the system analysis by proposing such revisions in the form of a recommended system design. The principal objective is to overcome the lack of processing-time effectiveness disclosed in Chapter III.

The system design recommended in this chapter is consistent with the constraints and assumptions enumerated in the Introduction to this analysis. The revisions or deletions to existing policies which govern its design are as follows:

1. Changes will be processed in two categories:

   (a) High-volume changes (valued at less than $10,000).

   (b) High-value changes (valued at $10,000 or more).

2. Permanent negotiating teams will be organizationally established within SUPSHIPS, composed of the negotiators and adequate representation from the technical and audit functional elements.[1]

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[1] This policy contemplates the assignment of Defense Audit Agency personnel to the SUPSHIPS organizations on a liaison basis. Such personnel would remain under the direct control of their own agency, however.

3. The contractor's organization will be revised to conform essentially with the permanent negotiating team organization.

4. The permanent Government negotiating team will be permanently housed in the same or adjoining office spaces, preferably adjacent to the contractor's group.

5. Formal, written communication will be limited to that deemed necessary for record-keeping purposes.

6. Realistic time standards will be prescribed for performance in each of the system's phases similar to those synthesized in Chapter III.

7. The change order reporting system will be revised to conform to the "management by exception" principle.

8. The contractor will combine the preparation and submittal of scopes and proposals for high-value changes into one document.

9. General agreement will be reached with the contractor regarding the content and format for proposals subjected to (a) price analysis and (b) cost analysis.

10. Proposals for high-volume changes will be submitted in weekly batches.

11. Price analysis, conforming essentially to the description contained in ASPR 3-807, will be used to evaluate high-volume changes.[2]

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[2] Price analysis may be defined as a comparison of proposed price, not including contractor's cost data, with an independent Government estimate. See ASPR, paragraph 3-807.2 (b).

12. All proposals and scopes will be reviewed for technical adequacy. A written technical analysis report is not required for proposals subjected to price analysis.

13. Proposals valued at $100,000 or more will be audited. Proposals below this amount will be audited on a selective sampling basis. Audits of projected labor and overhead rates will be used to analyze proposals not subjected to a specific audit.

14. Audits and technical analyses will be conducted jointly whenever both are required and interdependent.

15. Unadjudicated proposals will be revised and resubmitted in cases where a measurable change in cost of pricing information is recognized or within ninety days of submission.

16. High-value changes will be negotiated in weekly batches. Failure to reach agreement on the price of part of the batch should not prevent further processing of the remainder; the parts which are not acceptable to both parties should be broken out and adjudicated separately.[3]

Description of System Design

The following is a brief description of a recommended system designed to overcome the processing-time deficiency of the current change

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[3]This break-out refers to major deficiencies. Minor differences may be ignored under "package" principles provided the aggregate price is acceptable to both parties. See page 92.

[illegible]

[illegible]

[illegible]

without unacceptable trade-offs in the quality of the output. The recommended system design is described in two parts for simplification and clarity. The first part describes the processing of high-volume changes; the second describes high-value change processing.

High-Volume Changes

Pre-issuance phase. --Upon receipt of a high-volume change from either the Bureau or a technical section of the SUPSHIP organization, the negotiating team:

1. Reviews the change for contractual and technical adequacy, resolving any questions with the originator.

2. If a Category "B" or "D" change, determines whether or not its accomplishment during construction is technically desirable. If not, returns the change to the Bureau.

3. If a Field change or Category "A" change, or if a Category "B" or "D" change is to be accomplished, estimates a reasonable price adjustment required for financial obligation purposes and subsequent price analysis based on the auditor's projected rates, the contractor's existing system, and technical judgment.

4. Determines whether the change should be processed as a change order or unpriced supplemental rather than a pre-priced supplemental agreement. If so, justifies the decision in writing.

5. Prepares and issues the necessary modification or request for proposal and forwards it to the contractor.

Pre-proposal phase. --Upon receipt of the modification or request for proposal, the contractor's team:

1. Prepares a combined scope-proposal document in accordance with the general understanding reached with the SUPSHIP in regard to format and content of price analysis proposals. These documents should be held for weekly submission as a package.

2. Submits the scope-proposal documents to the SUPSHIP team in weekly packages.

Proposal analysis phase. --Upon receipt of the weekly package, the SUPSHIP team:

1. Checks the individual proposals and scopes for technical adequacy.

2. Performs price analysis, as defined in ASPR 3-807, by comparing the independent estimates formulated by the team in the issue phase with the contractor's proposals.

3. Obtains the contractor's explanation for any significant disparity noted between the team's independent estimate and the contractor's proposal. The proposal need not be returned to the contractor for correction if the deficiencies are minor and the contractor initials the corrections made.

4. Prepares the Government's prenegotiation position for the complete package.

Negotiation phase. --Having completed preparation for negotiation, the SUPSHIP team, once each week:

1. Negotiates any differences between the prenegotiated position and the contractor's position.

2. Sets aside any proposals which cannot be resolved during the negotiating session for subsequent discussion and proceeds to finalize agreement on the balance. It is emphasized, however, that an attempt should be made to negotiate a total price for the package which is acceptable to both parties, notwithstanding pricing differences which may exist for individual changes within the package.

3. Prepares a supplemental agreement reflecting negotiated agreements reached and obtains necessary signatures.

High-Value Changes

Pre-issuance phase. -- Upon receipt of a high-value change, the negotiating team:

1. Reviews the change for contractual and technical adequacy, resolving any questions with the originator.

2. If a Category "B" or "D" change, determines whether or not its accomplishment at the time is technically desirable. If not, returns the change to the Bureau.

3. If a field change or Category "A" change, or if a Category "B" or "D" change is to be accomplished, estimates the price of the change for financial obligation purposes only.

4. Determines whether the change should be processed as a change order or unpriced supplemental agreement rather than a pre-priced supplemental agreement. If so, justifies the decision in writing.

5. Prepares and issues the necessary modification or request for proposal and forwards it to the contractor.

Pre-proposal phase. --Upon receipt of the modification or request for proposal, the contractor's team:

1. Reviews the document for technical adequacy and resolves any questions with the SUPSHIP team.

2. Prepares the scope to implement the change and transmits it to the SUPSHIP.

The SUPSHIP team then:

1. Reviews the scope for technical adequacy.

2. Resolves any questions with the originator and contractor.

3. Approves and returns the scope to the contractor.

The contractor:

1. Prepares a price proposal for the approved scope of work in accordance with the general understandings reached with the SUPSHIP in regard to format and content for cost-analysis proposals.

2. Submits the proposal to SUPSHIP.

Proposal analysis phase. --Upon receipt of the proposal, the SUPSHIP team:

For proposals of $100,000 or more -

1. Performs a combined technical analysis and audit and prepares a written report of findings for the negotiator.

2. Performs a cost analysis of the proposal based on the audit/technical analysis report.

3. Obtains the contractor's explanation for any significant disparity revealed by the cost analysis.

4. Prepares the Government's prenegotiation position.

For proposals of less than $100,000 -

1. Performs a technical analysis and prepares a written report of findings.

2. Prepares a cost analysis of the proposal based on the technical analysis report and the contractor's projected rates for labor and overhead which have been approved by the auditor.

3. Obtains the contractor's explanation for any significant disparity revealed by the cost analysis.

4. Prepares the Government's prenegotiation position.

Negotiation phase. --The SUPSHIP team:

1. Negotiates any differences between the prenegotiation position and the contractor's position.

2. Utilizes the full resources of both teams to resolve any differences.

3. Prepares a supplemental agreement reflecting the negotiated agreements reached and obtains necessary signatures.

APPENDIX

STATUS OF UNADJUDICATED CHANGES TO NAVY DEPARTMENT, BUREAU OF SHIPS, CONTRACTS FOR SHIP CONSTRUCTION AND CONVERSION, DECEMBER 31, 1965*

I. NUMBER OF CHANGES IN PROCESS

(Days by value categories in $000's)

Value	Days					
	1-30	31-60	61-90	91-	Total	Per Cent
0-.9	542	397	315	2,122	3,376	36
1- 9	377	309	289	2,240	3,215	35
10-49	162	140	145	1,246	1,693	18
50-99	31	44	25	314	414	4
100-	36	41	62	468	607	7
Total	1,148	931	836	6,390	9,305	
Per Cent	12	10	9	69		

* - Source: Bureau of Ships Monthly Report of Inventory of Changes on Hand, Period ending December 31, 1965.

II. NUMBER OF CHANGES AWAITING ISSUANCE

(Days by value categories in $000's)

Value	Days					
	1-30	31-60	61-90	91-	Total	Per Cent
0-.9	121	36	41	126	332	70
1- 9	25	12	10	45	92	19
10-49	5	6	2	17	30	6
50-99	1	4	3	3	11	2
100-	4	0	3	5	12	3
Total	164	58	59	196	477	
Per Cent	34	12	12	42		

III. NUMBER OF CHANGES AWAITING PROPOSALS

(Days by value categories in $000's)

Value	Days					
	1-30	31-60	61-90	91-	Total	Per Cent
0-.9	261	196	119	829	1,405	38
1- 9	210	156	147	794	1,307	35
10-49	76	50	54	523	703	19
50-99	12	5	5	109	135	4
100-	11	1	6	141	159	4
Total	570	409	330	2,396	3,705	
Per Cent	15	11	9	65		

IV. NUMBER OF PROPOSALS IN ANALYSIS

(Days by value categories in $000's)

Value	Days					
	1-30	31-60	61-90	91-	Total	Per Cent
0-.9	121	150	143	1,086	1,500	32
1- 9	114	117	114	1,251	1,596	34
10-49	68	77	85	653	883	19
50-99	18	33	14	194	259	6
100-	21	40	47	295	403	9
Total	343	417	403	3,479	4,641	
Per Cent	7	9	9	75		

V. NUMBER OF PROPOSALS IN NEGOTIATION

(Days by value categories in $000's)

Value	Days					
	1-30	31-60	61-90	91-	Total	Per Cent
0-.9	31	15	12	207	265	44
1- 9	28	14	18	150	210	34
10-49	13	7	4	63	87	14
50-99	0	2	3	8	13	3
100-	0	0	6	27	33	5
Total	72	48	43	455	618	
Per Cent	12	8	7	73		

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